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SHELTERBELT INSECT AND DISEASE EVALUATION

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ABSTRACT

During June of 1983 the Division conducted a 100% pest survey over 15 shelterbelts in six counties of northeastern South Dakota. Individual belts ranged in age from 6 to 40 years old, were 5-12 rows wide and were in fair to excellent condition with no evidence of grazing. A little over half of the belts had a developed sod layer. One of the major objectives of this survey was to get a better handle on what pests and problems were actually attacking shelterbelts, and in a very general sense, determine how much of an effect they were having.

By the end of the survey over 7,300 individual plants were inspected. There were 22 different host species found with the top six being green ash, found in 93% of the belts; eastern red cedar, Russian olive, honeysuckle and Siberian elm, each being found in 60% of the belts; and caragana found in 40% of the belts. Sixteen other species were also inspected.

Green ash had the greatest variety of pests with nineteen. Only cotoneaster and amur maple were completely healthy; no problems being found with either species. Many problems were not identifiable to the specific pest and were put into broad categories, such as leaf galls or leaf rollers. Indeed, this was one problem which we found with limiting the survey to one time of the year. We could note damage or symptoms, but in many cases were not able to determine the specific cause because it was gone by the time of our inspection.

INTRODUCTION

Ever since settlers first moved into the great plains attempts have been made to modify and beautify the environment through tree planting. Planting of shelterbelts and windbreaks intensified after the dust bowl days. In an effort to modify the environment and

reduce wind erosion, approximately 5,500 acres per year were planted to shelterbelts in South Dakota during the Prairie States Forestry Project. Planting shelterbelts did not cease when the project did as tree planting continued at about the same levels until 1981. Even now several thousand acres are being planted to trees each year.

Knowing that over 250,000 acres of trees have been planted since 1935, one question which arises is, "What has happened to them all?" One part of this answer must lie in the fact that most, if not all, of these trees were planted in areas not really conducive to tree survival and growth. While most soils in South Dakota will support trees, the weather, grass competition, poor seed source selections, and insect and disease attacks combine to put terrific stress on trees throughout their life. Often such stresses lead directly to tree mortality and even the loss of entire belts.

Because most of the trees used are really being planted outside of natural ranges, insect and disease problems can intensify. New environmental conditions may create stress, rendering the host more susceptible to normally innocuous pests. The new environment may be more suitable for an old pest, allowing its population to build to levels the host can no longer resist. Pests native to the area may find the introduced host with little to no resistance. Or, an introduced pest may find the new conditions favorable to attack the introduced host.

In order to deal with overall insect and disease problems we must first obtain a complete picture of which pest species are

attacking which hosts, how severe those attacks are, and when they occur. Some different methods of determining these things include areawide shelterbelt surveys designed to compile listings of the pests encountered (1), compiling checklists of different possible pests (2), or by searching through reports which compile listings of problems encountered during specific time periods (3,4).

The purpose of this survey was threefold: 1) work toward determining a more complete picture of the insect and disease problems affecting South Dakota's shelterbelts, 2) determine how much time, manpower and effort a survey like this takes, and (3 decide if the survey is worth expanding to cover the whole state.

METHODS

The survey was carried out in the spring of 1983. The following criteria were used as guides in selecting shelterbelts. First, the area to be included in the survey was restricted to the division's Aberdeen district (Figure 1). The original instructions were to spread selected belts over at least three counties. Age of the belts surveyed was divided into three classes: 5-15, 15-30, and over 30 years old. The size of the belt was to be from 1/2 to 3 acres and 5-10 rows wide. The overall condition of each belt was to be between good and excellent, eliminating any belt which was already poor, decrepit, or failing. Any belt with evidence of grazing was also eliminated. Finally, approximately half of the belts were to be grassed or sodded in while the rest were to be relatively free of grass competition.

Once a shelterbelt was selected the entire belt (or a portion if the belt was larger than needed) was inspected by checking each tree for symptoms or signs of insects or diseases. Each tree was recorded by species, as well as being healthy, dead or having evidence of any insect or disease problems. Insect and disease problems were further recorded as being light, moderate or heavily affecting the tree.

RESULTS

Figure 1 shows the locations of the fifteen shelterbelts finally selected and evaluated. Time constraints prohibited the surveying of more belts. The fifteen belts were spread over a total of six counties.

Table 1 shows the overall age, size, and condition of the belts used. Age ranged from 6 to 40 years old. Six belts were between 5 and 15, seven between 15 and 30, and two over 30 years old. Eight belts had moderate to heavy sod while the remaining seven had little to no grass within the belt. Five belts were rated as being in fair condition, eight as good and two belts were in excellent shape. Belts ranged in size from one half to two and one half acres. However, after a few larger belts were surveyed a decision based on time constraints was made to limit the survey size of any one belt or portion of a belt to one acre.

Upon reviewing the data no difference in number of problems could be determined between belts that were covered with sod and those were grass free. However, all of the belts listed in fair condition were

also noted to be full of sod. Subjectively the problems encountered in those five belts also seemed to be much more severe than those in the good to excellent belts. Also, the two belts listed as being in excellent shape, with no sod, while having wide variety of pests, did not appear to have as heavy infections or infestations as those belts in only fair condition.

There were 22 different tree and shrub species surveyed. The total number of individual plants examined came to over 7,300. Green ash was both the most common species found, 14 of the 15 belts contained green ash; and the most numerous species present. All species inspected are listed in Table 2.

Table 3 lists by host species all the pests or problems found associated with that species. As could be expected some of the most commonly planted species also had the greatest variety of problems. Green ash had 21 different problems. American elm had 9, lilac had 8 and Siberian elm had 7. Interestingly, no pests or problems at all were found on two species, amur maple and cotoneaster.

Table 4 contains a listing of the pests and problems encountered and ranked by severity in terms of how often they were found on their respective hosts.

DISCUSSION

The time and effort spent completing the survey was probably more than necessary for the information obtained. Approximately half way through the survey we noticed that virtually all of the problems we would find in any one belt or any one species were found within the first dozen or so trees. After that it was virtually a repetition of the rest of those problems throughout the rest of the row or belt. At that point we made a decision to limit any one plot to a portion of the belt one acre in size. After completing the survey I believe even this is really too large. A smaller plot size in each belt would be more efficient and allow time to survey more belts. Another time factor which must be considered in any subsequent survey deals with identifying the individual problems. If more time had been allowed for identification, I feel certain many of the "problems" could have been specifically identified.

As was expected prior to conducting the survey, there were a lot of pests and problems found at fairly low levels, such as spiny elm caterpillars on Siberian elm, ash plant bugs on green ash, frost on lilacs, and top dieback on caragana. Most of these types of problems are ones which are always around but are usually of very little significance.

There was also the other extreme, pests which were found in abundance, or at only moderate levels but still inflicting a lot of damage. Many of these are briefly discussed below under their respective hosts.

Major Species

Green Ash

The most common problem found was ash anthracnose (Gloeosporium aridum). One third of the trees and almost every belt had some to heavy infections, probably caused by an abnormally wet spring. Ash borers (Podosesia syringae) were very common with evidence found in almost every belt. However, only a small percentage of the total trees (13%) were affected at the time of this survey. Nectria canker (Nectria galligena) was found on a few trees in a number of belts. Other problems found in several belts, but on only a few trees, included an undetermined top dieback, ash leaf curl aphids (Prociphilus fraxinifolia), ash leaf rust (Puccinia peridermiospora), tree crickets (Oecanthus sp.), various leaf galls and an unidentified leaf curling fly larva. Surprisingly ash heartrot (Fomes fraxinophilus) was found in only 2 of 14 belts and on only 0.3% of the total trees inspected.

American elm

The most common problem was one of leaf chewing by insects that were no longer around. Various leaf galls and the wooly elm aphid (Eriosoma americanum) were found on a sizeable number of trees in most of the belts inspected. The rest of the problems encountered, including Dutch elm disease (Ceratocystis ulmi) were not really very common.

Lilac

Powdery mildew (Microsphaera alni) was by far the most common problem although it was never found in any abundance, possibly because of the timing of the survey.

Siberian elm

Siberian elm cankers (Botryodiplodia hypodermia) was found in almost every belt and on more than two thirds of the trees. This canker has definitely been increasing in intensity for several years.

Boxelder

The most common problem was an undiagnosed top dieback. This may have been related to old herbicide damage as this is becoming more and more common throughout the state.

Russian Olive

Stem cankers were found on a little more than one third of the total trees inspected and in all but one belt. With this widespread distribution and intensity this problem could easily increase in importance in the coming years.

Ponderosa pine

Two related problems, pine tip moths (Rhyacionia sp.) and shoot borers (Eucosoma somana) were both very prevalent infesting 36% and 20% respectively of the total trees inspected. However, because they were each concentrated in only 1 of the 4 belts containing the host the damage was much worse than the figures show. It appears that once into a belt this pest has the capacity for a population buildup to very serious levels.

Hackberry

Herbicide damage and an undiagnosed branch dieback (possibly related to old herbicide damage) was very common.

Eastern redcedar

Two problems which often cause a lot of concern, cedar blights (Phomopsis, Cercospora and Kabatinia) and cedar-apple rust (Gymanosporangium juniperi-virginianae) were both widespread but neither was very prominent.

Honeylocust

Thyronectria canker (Thyronectria austro-americana) was found on 20% of all honeylocust inspected, although the host was only found in two belts. There is a fairly large percentage of trees affected and may seriously lower the effectiveness of the honeylocust row as a part of the shelterbelt.

Other Species

Leaf galls and foliage problems were very common on many of the fruit tree hosts such as plum, chokecherry, and Nanking cherry. Some problems are listed in the tables as being extremely numerous on both belts and number of trees. However, closer inspection will show either that most of these hosts contained a limited number of trees or were found in only one belt, such as frost on black walnut and top dieback on Nanking cherry. The problems on willows were all on the only row found and it was in one of the oldest belts surveyed.

There were numerous other problems encountered and are listed in Tables 3 and 4. However, most of them were only found in very limited numbers and are usually considered nuisance pests.

RECOMMENDATIONS

1. If this or similar surveys are conducted in the future they need not be nearly as intense as what was done this time. A lot of information was collected that in the end had little or no meaning.

2. Any future surveys should be spread throughout the growing season rather than be done all at one time of the year. This should help alleviate the problem of seeing symptoms without the pest. Further, spreading the surveys throughout the growing season would also pick up any pests or problems which normally do not occur until later in the season.

3. Surveys such as this one are extremely beneficial in keeping informed as to what problems are occurring over wide areas. They are especially informative for new foresters just starting work in those areas. However, they are somewhat time consuming. Serious thought should be given to having new foresters conduct a less intense version of this survey in their first year of work. This would accomplish two things: 1) provide the new forester with a handle on species commonly planted, shelterbelt conditions and major pests and problems in his area and 2) provide the state, through the pest specialist, with occasional information on current shelterbelt pest problems.

4. For basically the same reasons as in #1 above it may be useful if all districts conducted at least one abbreviated survey each year. That way all field personnel would have updated knowledge of the pests and problems in their district. Trends in pest populations can also be followed more closely giving the division a method for keeping the public better informed on actual and potential tree problems.

LITERATURE CITED

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4. Lister, Kendall, C. and Diane M. Hildebrand. 1983. Forest Insect and Disease Conditions in the Rocky Mountain Region for 1983. Timber, Forest Pest, and Cooperative Forest Management, Rocky Mountain Region, USDA For. Serv. Lakewood, CO. 40 p.

TABLE 1 - SHELTERBELT PEST SURVEY;
Overall Shelterbelt Conditions

Belt Name	Size (acres)	Age (years)	Condition	Sod	#rows	Species
Hamlin 1	1.2	6	Good	No	5	4
Hamlin 2	1.2	40	Good	No	12	7
Clark 1	1.5	7	Excellent	No	12	7
Clark 2	1.5	20	Good	Yes	9	8
Brown 1	1.5	10	Good	No	8	4
Brown 2	1.0	20	Good	Yes	9	7
Brown 3	2.5	25	Fair	Yes	9	7
Brown 4	1.0	14	Good	No	9	6
Brown 5	1.5	20	Fair	Yes	6	5
Brown 6	0.5	10	Good	Yes	8	6
Beadle 1	1.5	20	Fair	Yes	7	5
Beadle 2	1.0	20	Good	No	6	4
Kingsbury 1	1.0	30	Fair	Yes	8	6
Kingsbury 2	1.0	10	Excellent	No	7	6
Codington	1.0	40	Fair	Yes	7	5

TABLE 2 - SHELTERBELT PEST SURVEY;
Listing of Host Species Surveyed

HOST

Common Name	Species Name	Belts No.	Belts %	Trees No.	Trees %
American elm	Ulmus Americana	14	27	279	3.8
Amur maple	Acer ginnala	1	7	88	1.2
Black Hills spruce	Picea glauca	2	13	84	12
Boxelder	Acer negundo	3	20	1157	2.2
Bur oak	Quercus macrolarpa	1	7	28	0.4
Caragana	Caragana arborescens	6	40	573	7.8
Chokecherry	Prunus virginiana	1	7	152	2.1
Cotoneaster	Cotoneaster acutifoloa	2	13	368	5.0
Cottonwood	Populus spp.	3	20	82	1.1
Eastern red cedar	Juniperus virginiana	9	60	567	7.8
Green ash	Fraxinnus pennsylvania	14	93	1356	13.6
Hackberry	Celti occidentalis	2	13	123	1.7
Honeylocust	Gleditsia triacanthos	2	13	192	2.6
Honeysuckle	Lonicera tataricae	9	60	899	12.3
Lilac	Syrinu vulgaris	5	33	334	4.6
Nanking cherry	Prunus tomentosa	1	7	55	0.8
Plum	Prunus	1	7	5	0.1
Ponderosa pine	Pinus ponderosa	4	27	297	4.1
Russian olive	Elaeagnas angustifolia	11	73	758	10.4
Siberian elm	Ulnus Pumilu	9	60	859	11.8
Walnut	Juglais Nigra	1	7	14	0.2
Willow	Salix spp.	1	7	30	0.4

TABLE 3: SHELTERBELT PEST SURVEY:
List of Pests and Problems Found by Host

HOST	PROBLEMS	PERCENT TREES AFFECTED	PERCENT BELTS AFFECTED
AMUR MAPLE	NONE FOUND		
COTONEASTER	NONE FOUND		
GREEN ASH	ANTHRACNOSE	32.6%	93%
	ASH PLANT BUG	14.7%	7%
	ASH BORER	13.9%	86%
	ASH LEAF APHIDS	3.9%	21%
	TOP DIEBACK	3.4%	36%
	BLISTER LEAF GALLS	2.9%	7%
	LEAF CURL APHIDS	2.2%	29%
	LEAF RUST	1.5%	29%
	TREE CRICKETS	1.5%	29%
	LEAF GALLS	1.3%	29%
	NECTRIA CANKER	1.0%	36%
	BLACK HEADED ASH SAWFLY	0.6%	21%
	BLACK HEADED LEAF ROLLER	0.6%	21%
	LEAF CURL MAGGOTS	0.6%	29%
	ASH SAWFLY	0.4%	14%
	DEER	0.4%	7%
	ASH HEARTROT	0.3%	14%
	FLOWER BUD GALL MITES	0.2%	14%
	INCHWORMS	0.1%	7%
	LEAF SPOTS	0.1%	7%
	YELLOW BELLIED SAPSUCKER	0.1%	7%
AMERICAN ELM	SHOT HOLE & CHEWING	66.7%	50%
	LEAF GALLS	25.8%	75%
	LEAF CURL APHIDS	22.9%	75%
	ANTHRACNOSE	9.7%	50%
	STEM CANKERS	9.7%	75%
	INCHWORMS	2.5%	25%
	NIPPLE GALLS	2.5%	25%
	DUTCH ELM DISEASE	0.7%	25%
	LEAF ROLLERS	0.7%	25%

LILAC	POWDERY MILDEW	21.3%	40%
	INCHWORMS	18.0%	20%
	TOP DIEBACK	10.5%	20%
	FROST	0.3%	20%
	ASH LILAC BORERS	NOT COUNTED	
	FALL WEBWORMS	NOT COUNTED	
	LEAF BLOTCH	NOT COUNTED	
	LEAF ROLLERS	NOT COUNTED	
SIBERIAN ELM	SIBERIAN ELM CANKERS	67.6%	89%
	SLIME FLUX	2.3%	33%
	SHOT HOLE & CHEWING	0.6%	22%
	ANTHRACNOSE	0.2%	11%
	SPINY ELM CATERPILLARS	0.1%	11%
	YELLOW BELLIED SAPSUCKER	0.1%	11%
	LEAF BLISTERS	NOT COUNTED	
HONEYSUCKLE	LEAF SPOTS	22.8%	22%
	LEAF CURL AND BLOTCH	12.8%	44%
	HONEYSUCKLE APHID	8.0%	22%
	TOP DIEBACK	0.8%	22%
	LEAF ROLLERS	0.4%	22%
	FALL WEBWORMS	0.1%	11%
BOXELDER	TOP DIEBACK	26.1%	33%
	LEAF GALLS	8.9%	33%
	LEAF APHIDS	1.3%	33%
	NIPPLE GALLS	0.6%	33%
	STEM APHIDS	NOT COUNTED	
RUSSIAN OLIVE	STEM CANKERS	37.5%	82%
	HAIL DAMAGE	10.2%	9%
	RABBITS	0.5%	9%
	YELLOW BELLIED SAPSUCKER	0.1%	9%
	TREE CRICKETS	NOT COUNTED	
PONDEROSA PINE	TIP MOTHS	36.4%	25%
	SHOOT BORERS	20.2%	25%
	STEM CANKERS	6.1%	25%
	DIPLODIA TIP BLIGHT	3.0%	25%
HACKBERRY	HERBICIDE DAMAGE	64.2%	50%
	BRANCH DIEBACK	15.4%	50%
	SHOT HOLE & CHEWING	3.3%	50%
	WITCHES BROOM	0.8%	50%
EASTERN RED CEDAR	GRASSHOPPER	16.8%	44%
	BLIGHT	3.5%	44%
	CEDAR APPLE RUST	1.8%	56%
	YELLOW BELLIED SAPSUCKER	0.2%	11%

HONEYLOCUST	THYRONECTRIA CANKER	19.8%	100%
	LEAF BEETLES	0.5%	50%
	RABBITS	NOT COUNTED	
CHOKECHERRY	BLADDER LEAF GALLS	97.8%	100%
	BLACK KNOT	95.3%	100%
	TENT CATERPILLARS	1.1%	100%
COTTONWOOD	TOP DIEBACK	40.2%	67%
	STEM CANKERS	6.1%	33%
	SLIME FLUX	1.2%	33%
PLUM	LEAF GALLS	100.0%	100%
	LEAF CURL APHIDS	NOT COUNTED	
	ROSETTE GALLS	NOT COUNTED	
CARAGANA	TOP DIEBACK	0.3%	17%
	LEAF GALLS	NOT COUNTED	
WILLOW	TOP DIEBACK	80.0%	100%
	BASAL CANKERS	26.7%	100%
BUR OAK	LEAF ROLLERS	7.1%	100%
	DEER	NOT COUNTED	
BLACK HILLS SPRUCE	NEEDLE MINERS	16.7%	50%
	RABBITS	NOT COUNTED	
BLACK WALNUT	FROST	100.0%	100%
NANKING CHERRY	TOP DIEBACK	100.0%	100%

TABLE 4: SHELTERBELT PEST SURVEY;
Alphabetical Listing of Problems Found

PROBLEMS	HOST	PERCENT BELTS AFFECTED	PERCENT TREES AFFECTED
ANTHRACNOSE (Gloeosporium aridum)	GREEN ASH	93%	32.6%
ANTHRACNOSE	AMERICAN ELM	50%	9.7%
ANTHRACNOSE (Gloeosporium inconspicuum)	SIBERIAN ELM	11%	0.2%
ASH BORER (Podosesia syringae)	GREEN ASH	86%	13.9%
ASH HEARTROT (Fomes fraxinophilus)	GREEN ASH	14%	0.3%
ASH LEAF APHIDS (unknown)	GREEN ASH	21%	3.9%
ASH PLANT BUG (Neoborus amoenus)	GREEN ASH	7%	14.7%
ASH SAWFLY (unknown)	GREEN ASH	14%	0.4%
BASAL CANKERS (unknown)	WILLOW	100%	26.7%
BLACK HEADED ASH SAWFLY (Tethida cordigera)	GREEN ASH	21%	0.6%
BLACK HEADED LEAF ROLLER (Archips spp.)	GREEN ASH	21%	0.6%
BLACK KNOT (Apiosporina morbosa)	CHOKECHERRY	100%	95.3%
BLIGHT (species undetermined)	EASTERN RED CEDAR	44%	3.5%
BLISTER LEAF GALLS (Taphrina ?)	GREEN ASH	7%	2.9%
BOXELDER APHIDS (Periphyllus negundinis)	BOXELDER	33%	1.3%
BRANCH DIEBACK (unknown)	HACKBERRY	50%	15.4%
CEDAR APPLE RUST (Gymnosprangium juniperi-virginiana)	EASTERN RED CEDAR	56%	1.8%
DEER (Odocoileus spp.)	GREEN ASH	7%	0.4%
DIPLODIA TIP BLIGHT (Diplodia pinea)	PONDEROSA PINE	25%	3.0%
DUTCH ELM DISEASE (Ceratocystis ulmi)	AMERICAN ELM	25%	0.7%
FALL WEBWORMS (Hyphantria cunea)	HONEYSUCKLE	11%	0.1%
FINGER GALLS (Eriophyes emarginata)	CHOKECHERRY	100%	97.8%
FLOWER BUD GALL MITES (Eriophyes fraxiniflora)	GREEN ASH	14%	0.2%

FROST	BLACK WALNUT	100%	100.0%
FROST	LILAC	20%	0.3%
GRASSHOPPER (Melanopus spp.)	EASTERN RED CEDAR	44%	16.8%
HAIL DAMAGE	RUSSIAN OLIVE	9%	10.2%
HERBICIDE DAMAGE	HACKBERRY	50%	64.2%
HONEYSUCKLE APHID (Hyadaphis tartarica)	HONEYSUCKLE	22%	8.0%
HONEYSUCKLE BLIGHT (Insolibasidum deformans)	HONEYSUCKLE	44%	12.8%
INCHWORMS (Geometridae)	AMERICAN ELM	25%	2.5%
INCHWORMS (Geometridae)	LILAC	20%	18.0%
INCHWORMS (Geometridae)	GREEN ASH	7%	0.1%
LEAF BEETLES (unknown)	HONEYLOCUST	50%	0.5%
LEAF CURL APHIDS (Prociphilus fraxinifolii)	GREEN ASH	29%	2.2%
LEAF CURL MAGGOTS (unknown)	GREEN ASH	29%	0.6%
LEAF GALLS (undetermined)	PLUM	100%	100.0%
LEAF GALLS (undetermined)	AMERICAN ELM	75%	25.8%
LEAF GALLS (undetermined) (Contarina negundifolia)	BOXELDER	33%	0.6%
LEAF GALLS	BOXELDER	33%	8.9%
LEAF GALLS (undetermined)	GREEN ASH	29%	1.3%
LEAF GALLS (Aceria ulmicola)	AMERICAN ELM	25%	2.5%
LEAF ROLLERS (Acrobasis spp)	BUR OAK	100%	7.1%
LEAF ROLLERS (Archips argyrospilus)	AMERICAN ELM	25%	0.7%
LEAF ROLLERS (unknown)	HONEYSUCKLE	22%	0.4%
LEAF RUST (Puccinia sparagnoides)	GREEN ASH	29%	1.5%
LEAF SPOTS (undetermined)	HONEYSUCKLE	22%	22.8%
LEAF SPOTS (undetermined)	GREEN ASH	7%	0.1%
NECTRIA CANKER (Nectria galligena)	GREEN ASH	36%	1.0%
NEEDLE MINERS (Taniva albolineana)	BLACK HILLS SPRUCE	50%	16.7%
POWDERY MILDEW (Microsphaera alni)	LILAC	40%	21.3%
RABBITS (Silvilagus & Lepus spp.)	RUSSIAN OLIVE	9%	0.5%
SHOOT BORERS (undetermined)	PONDEROSA PINE	25%	20.2%

SHOT HOLE & CHEWING (undetermined)	HACKBERRY	50%	3.3%
SHOT HOLE & CHEWING (undetermined)	AMERICAN ELM	50%	66.7%
SHOT HOLE & CHEWING (undetermined)	SIBERIAN ELM	22%	0.6%
SIBERIAN ELM CANKERS (Botryodiplodia hypodermia)	SIBERIAN ELM	89%	67.6%
SLIME FLUX (bacteria)	COTTONWOOD	33%	1.2%
SLIME FLUX (bacteria)	SIBERIAN ELM	33%	2.3%
SPINY ELM CATERPILLARS (Nymphalis antiopa)	SIBERIAN ELM	11%	0.1%
STEM CANKERS (undetermined)	RUSSIAN OLIVE	82%	37.5%
STEM CANKERS (undetermined)	AMERICAN ELM	75%	9.7%
STEM CANKERS (undetermined)	COTTONWOOD	33%	6.1%
STEM CANKERS (undetermined)	PONDEROSA PINE	25%	6.1%
TENT CATERPILLARS (Malacosoma spp.)	CHOKECHERRY	100%	1.1%
THYRONECTRIA CANKER (Thyronectria austro-americana)	HONEYLOCUST	100%	19.8%
TIP MOTHS (Rhyacionia spp.)	PONDEROSA PINE	25%	36.4%
TOP DIEBACK (undetermined)	WILLOW	100%	80.0%
TOP DIEBACK (undetermined)	NANKING CHERRY	100%	100.0%
TOP DIEBACK (undetermined)	COTTONWOOD	67%	40.2%
TOP DIEBACK (undetermined)	GREEN ASH	36%	3.4%
TOP DIEBACK (undetermined)	BOXELDER	33%	26.1%
TOP DIEBACK (undetermined)	HONEYSUCKLE	22%	0.8%
TOP DIEBACK (undetermined)	LILAC	20%	10.5%
TOP DIEBACK (undetermined)	CARAGANA	17%	0.3%
TREE CRICKETS (Oecanthus spp.)	GREEN ASH	29%	1.5%
WITCHES BROOM (Sphaerotheca phytoptophila & Eriophyes spp.)	HACKBERRY	50%	0.8%
WOOLY ELM APHIDS (Eriosoma americanum)	AMERICAN ELM	75%	22.9%
YELLOW BELLIED SAPSUCKER	SIBERIAN ELM	11%	0.1%
YELLOW BELLIED SAPSUCKER	EASTERN RED CEDAR	11%	0.2%
YELLOW BELLIED SAPSUCKER	RUSSIAN OLIVE	9%	0.1%
YELLOW BELLIED SAPSUCKER (Sphyrapicus varius)	GREEN ASH	7%	0.1%
ASH LILAC BORERS (Podosesia syringae)	LILAC	NOT COUNTED	
DEER (Odocoileus spp.)	BUR OAK	NOT COUNTED	
FALL WEBWORMS (Hyphantria cunea)	LILAC	NOT COUNTED	

LEAF BLISTERS (undetermined)	SIBERIAN ELM	NOT COUNTED
LEAF BLOTCH (Heterosporium syringae)	LILAC	NOT COUNTED
LEAF CURL APHIDS (undetermined)	PLUM	NOT COUNTED
LEAF GALLS (unknown)	CARAGANA	NOT COUNTED
LEAF ROLLERS (Acrobasis spp.)	LILAC	NOT COUNTED
RABBITS	BLACK HILLS SPRUCE	NOT COUNTED
RABBITS (Silvilagus & Lepus spp.)	HONEYLOCUST	NOT COUNTED
ROSETTE GALLS (unknown)	PLUM	NOT COUNTED
STEM APHIDS (Periphullus negundinis)	BOXELDER	NOT COUNTED
TREE CRICKETS	RUSSIAN OLIVE	NOT COUNTED

FIGURE 1: SHELTERBELT INSECT AND DISEASE EVALUATION - PLOT LOCATIONS

* Approximate Plot Location

Aberdeen District